THE CERES S'COOL PROJECT

STUDENTS' CLOUD OBSERVATIONS ON-LINE

Lin Chambers, Kay Costulis, and David Young
NASA LaRC, Hampton, VA

Tina Rogerson (ASDC), Joyce Fischer, Susan Moore, and Roberto Sepulveda
SAIC

CERES Science Team Meeting
Williamsburg, VA
November 2, 2004

What is S'COOL?

- Education and Public Outreach arm of CERES
- A simple way to involve K-12 students in real science
- A source of validation data for the CERES cloud data
- Began in 1997

S'COOL Needs YOU!

- **Participants in every state and 65 countries**
  - Offer to serve as a **resource to a local teacher**
  - Arrange a **S'COOL visit when traveling**
  - Provide **S'COOL info to teachers you know**
- **Presentation materials available**, with script suggestions
- **Help with translation of materials** (especially German and Italian)
- **Serve as resource for scientific content questions sent in by participants**

Impact Measures

Database of observations - as of 10/28/04

- 36,307 observations
- 1752 registered participants

  36% have submitted data
- 65 countries

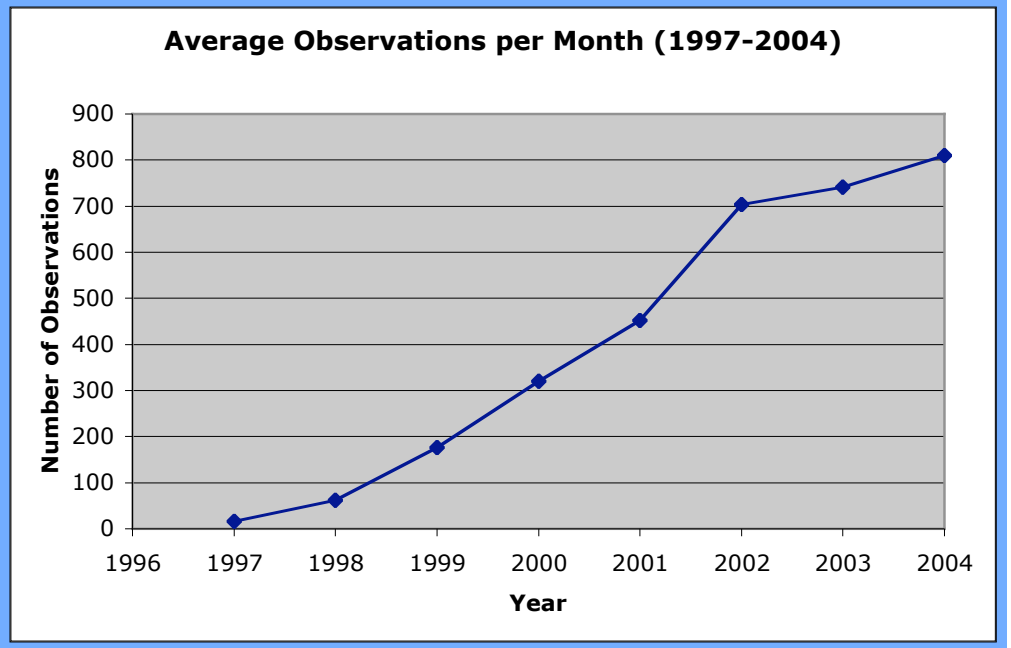
  data from 47 (72%)
- Over 9000

Ground/CERES

T&S Correspondences

Observation "Top Five"

- ♣United States
- ♣Croatia
- ♣Colombia
- ♣Nicaragua
- ♣France



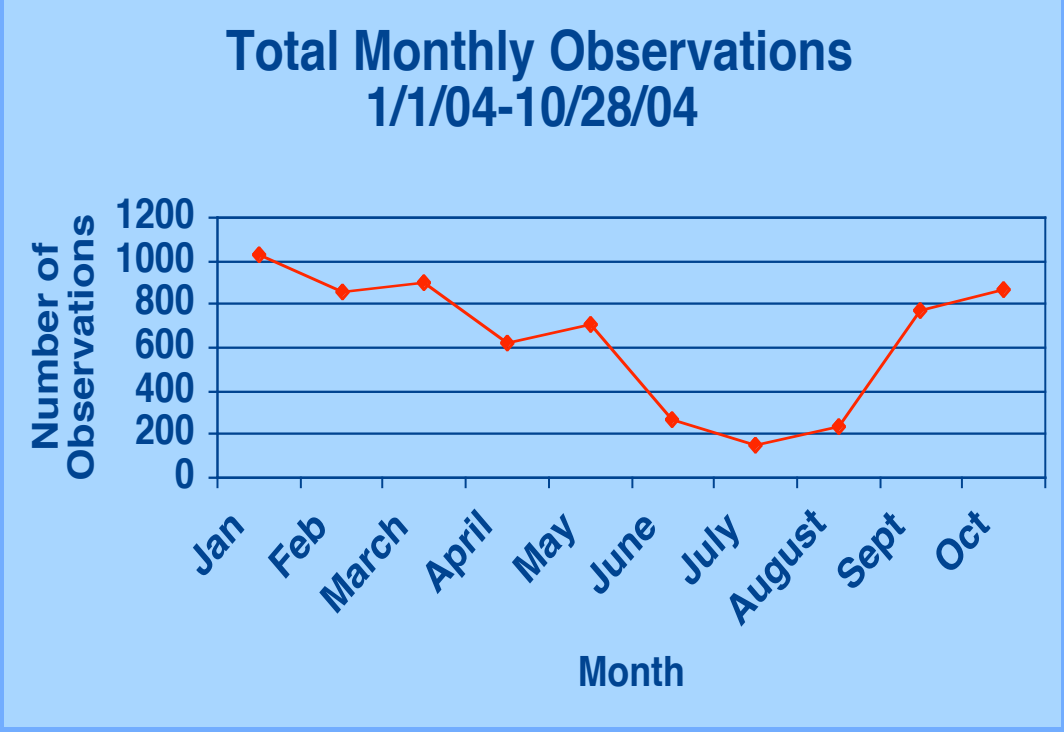
Impact Measures (cont'd)

Cyclic trend in observations

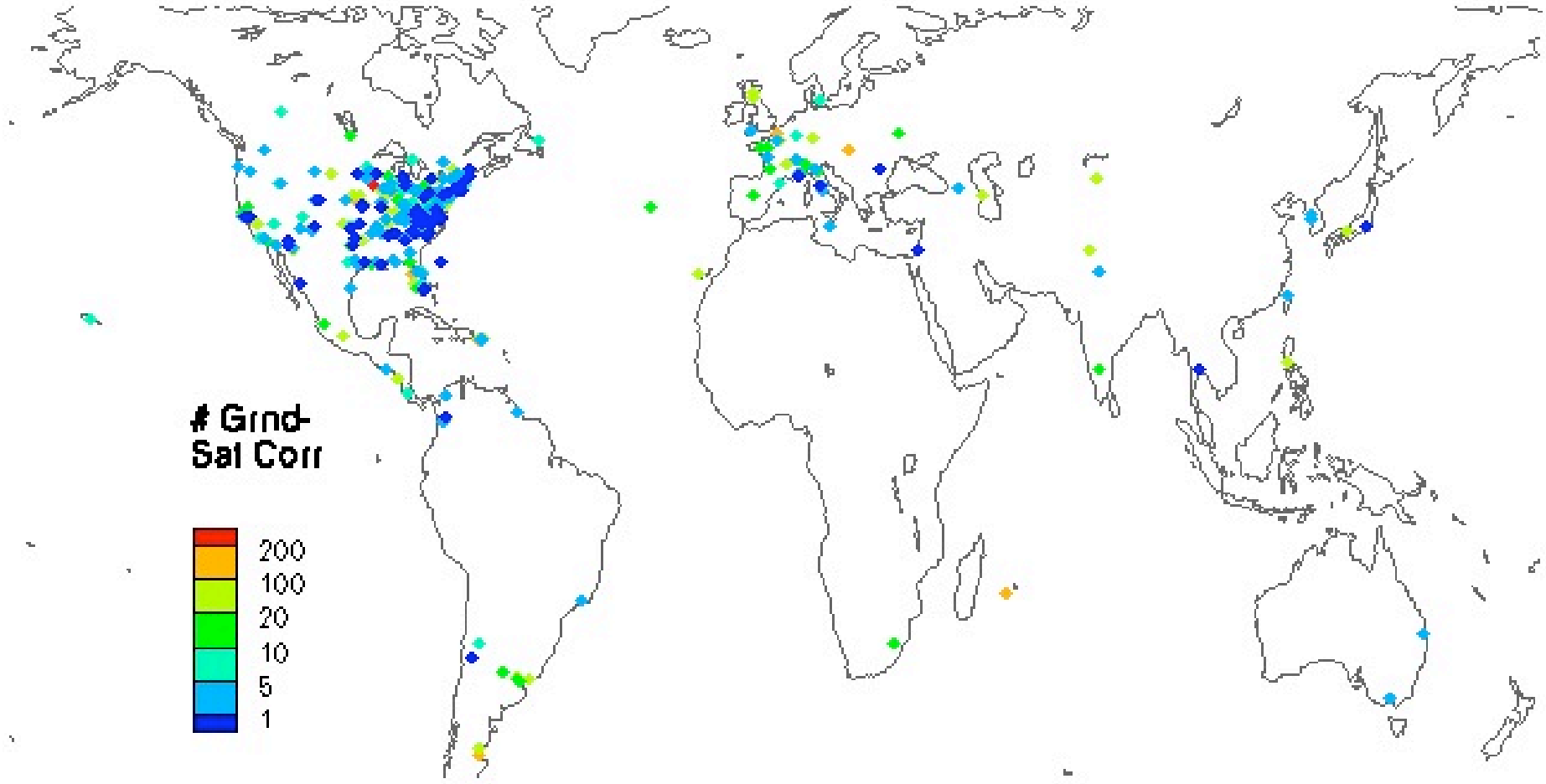
Total number is lower during American schools' "traditional" summer break.

Opportunity

Increased efforts to engage "summer schools", year-round schools, and informal science education groups



Data Available



Max: 479 (High School in Pennsylvania)
Min: 1 (70 schools)

Comparing to Satellite

- S'COOL Site
  Matched to
  1 degree
  Satellite Region

- Observation
  Times
  Within
  15 Minutes

School Name	Latitude	Longitude	City	State	Country
Greensboro Day School	36.20	-79.80	Greensboro	NC	USA

Surface Information				Satellite Information 239965				
Date: 2002-10-10		Universal Time: 15:54		Date: 2002-10-10		Universal Time: 15:53		
Satellite: Terra				Satellite: Terra				
Opacity	Cloud Cover	Type	Visualization		Altitude	Opacity	Cloud Cover	Phase Temp (K)
								
Opacity	(95% to 100%)	Altostratus			7.40	Opaque 28.40	(95% to 100%) 100.00	mixed 253.40
Opaque	(5% to 50%)	Stratus						
								
Persistent Contrails: 00		Short-Lived Contrails: 00						
Surface Observations:	Snow/Ice: No Standing Water: No Muddy: No Dry Ground: Yes Leaves on Trees: Yes							
Temperature: 19.00 C Barometric Pressure: 1024.00 hPa Relative Humidity: 35.00 %								
Comments: submitted by Matthew Fore and Mr. Martin.								

Cloud Amount Comparison

		S'COOL Students			
		Clear	Partly Cloudy	Mostly Cloudy	Overcast
Satellite	Clear	1415	350	101	48
	Partly Cloudy	624	897	575	230
	Mostly Cloudy	193	553	695	680
	Overcast	143	187	489	1992

191 3-class errors (2%) - ~1/3 easily explainable

711 2-class errors (8%) - need more study

3271 1-class errors (36%) - may be near-matches

Students Overcast vs. Satellite Clear (48 cases)

- **Spatial Mismatch?:** >1/3 are schools located less than 0.1 degree from the edge of a lat/long grid box.
- **Universal Time?:** 3 cases with incorrect UT
- **Student/Satellite error?:** remaining cases have no clear explanation. Study needed.
- **Snow:** 10 cases, yet the satellite still reports clear sky.

		S'COOL Students			
		Clear	Partly Cloudy	Mostly Cloudy	Overcast
Satellite	Clear	1415	350	101	48
	Partly Cloudy	624	897	575	230
	Mostly Cloudy	193	553	695	680
	Overcast	143	187	489	1992

Students Clear vs. Satellite Overcast (143 cases)

- **Spatial mismatch?:** About 22%
- **Universal Time?:** ~10
- **Snow?:** 18 cases students report snow.
  - Only one satellite retrieval is suspect: low cloud temperature 2.5K below the surface temperature.
- **Satellite/Student error?:** stratus = clear?

		S'COOL Students			
		Clear	Partly Cloudy	Mostly Cloudy	Overcast
Satellite	Clear	1415	350	101	48
	Partly Cloudy	624	553	575	230
	Mostly Cloudy	193	553	695	680
	Overcast	143	187	489	1992

Future Plans for Data Analysis

- **Inviting S'COOL participants to do detailed analysis of their correspondences**

- **More analysis to be done (2-class and 1-class errors, cloud levels, opacity….)**

- **Data available via the Internet for analysis:**

http://asd-www.larc.nasa.gov/SCOOL/usedata.html

S'COOL Team Presentations Since March 2004

- **3 Local, regional, state, or national conferences** (Posters, Share-a-Thons, Presentations, Workshops)

- **9 Presentations to student groups** (classroom visits, after-school groups, CHROME)

- **10 Other** (Girl Scouts summer day-camp, Region 2 Educators meeting, Explorer Schools training at LaRC, ESSEA Alliance, Newport News Elementary Science Lead Teachers, YMCA, NASA Explorer Institute for Nat'l Park Rangers, Education , South Carolina Blue Ribbon Schools)

S'COOL Peer-reviewed Papers and Publications

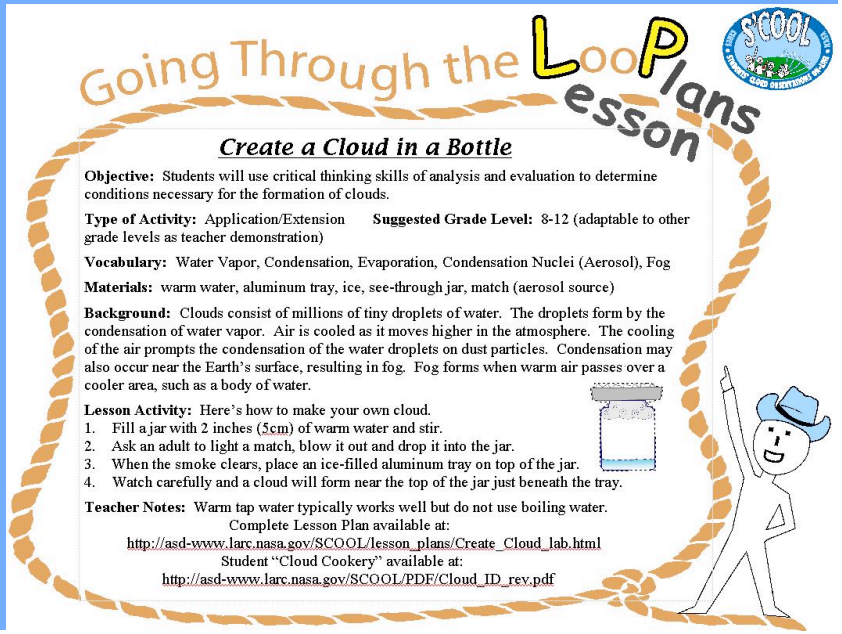
- **AMS Meeting** in Norfolk, VA
- **IGARSS Conference**, Anchorage, AK
- **Science and Children** magazine article by Linda Bryson, S'COOL ambassador
- **NASA Portal Earth Explorers** feature article about S'COOL student- participant, Abigail Hoglund

What's New at S'COOL?

- S'COOL cloud type Tutorial accepted by Earth and Space Science review panel

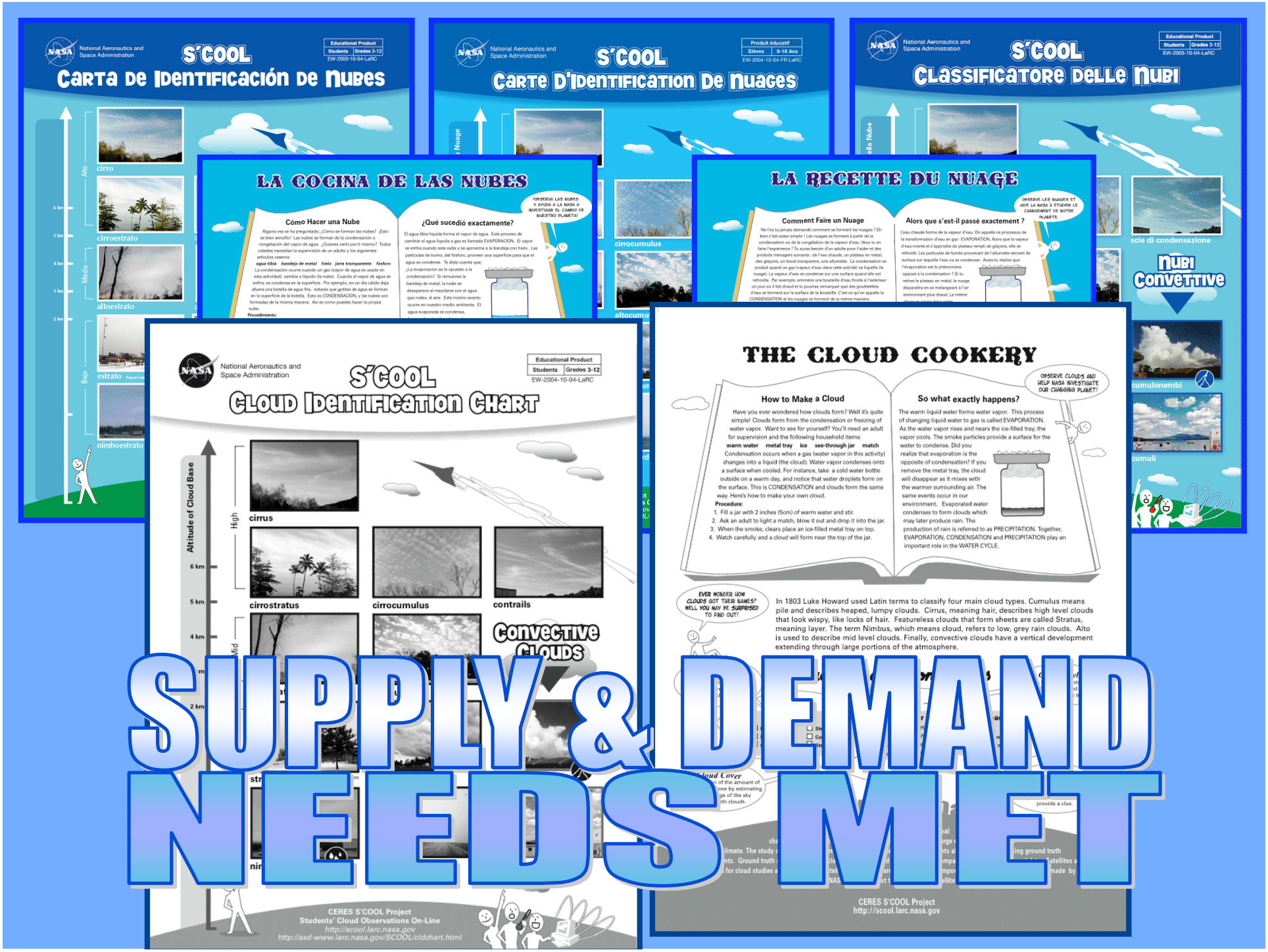
  http://asd-www.larc.nasa.gov/SCOOL/tutorial

- S'COOL Breeze Newsletter sent September 2004 with the next issue December 2004
  - English (1467)
  - French (54)
  - Spanish (207)



What's New? (cont'd)

- S'COOL Observation Award
- Links to Chinese and Thai versions of S'COOL website
- Italian poster is now available and Spanish poster has entered its second printing
- S'COOL One-page flyer
- Increase in number of S'COOL ambassadors (S'COOL Summer Workshop alumni serving as S'COOL presenters in their local, regional and state areas)
- New Intro Packet


National Aeronautics and Space Administration
S'COOL
Carta de Identificación de Nubes
Educational Product
Students | Grades 3-12
EW-2003-10-04-LaRC
cirro
cirroestrato
altoestrato
estrato
nimboestrato
Alto
Medio
Bajo
6 km
5 km
4 km
3 km
2 km
Produit éducatif
Élèves | 9-16 Ans
EW-2004-10-04-FR-LaRC
Carte D'Identification De Nuages
cirrocumulus
altocumulus
Classificatore delle Nubi
scie di condensazione
Nubi Convettive
cumulonembi
cumuli
LA COCINA DE LAS NUBES
Cómo Hacer una Nube
¿Qué sucedió exactamente?
¡OBSERVA LAS NUBES Y AYUDA A LA NASA A INVESTIGAR EL CAMBIO DE NUESTRO PLANETA!
LA RECETTE DU NUAGE
Comment Faire un Nuage
Alors que s'est-il passé exactement ?
OBSERVE LES NUAGES ET AIDE LA NASA À ÉTUDIER LE CHANGEMENT DE NOTRE PLANÈTE.
National Aeronautics and Space Administration
S'COOL
Cloud Identification Chart
Educational Product
Students | Grades 3-12
EW-2004-10-04-LaRC
Altitude of Cloud Base
High
Mid
6 km
5 km
4 km
2 km
cirrus
cirrostratus
cirrocumulus
contrails
Convective Clouds
CERES S'COOL Project
Students' Cloud Observations On-Line
http://scool.larc.nasa.gov
http://asd-www.larc.nasa.gov/SCOOL/cldchart.html
THE CLOUD COOKERY
How to Make a Cloud
So what exactly happens?
OBSERVE CLOUDS AND HELP NASA INVESTIGATE OUR CHANGING PLANET!
Procedure:
1. Fill a jar with 2 inches (5cm) of warm water and stir.
2. Ask an adult to light a match, blow it out and drop it into the jar.
3. When the smoke, clears place an ice-filled metal tray on top.
4. Watch carefully and a cloud will form near the top of the jar.
EVER WONDER HOW CLOUDS GOT THEIR NAMES? WELL YOU MAY BE SURPRISED TO FIND OUT!
In 1803 Luke Howard used Latin terms to classify four main cloud types. Cumulus means pile and describes heaped, lumpy clouds. Cirrus, meaning hair, describes high level clouds that look wispy, like locks of hair. Featureless clouds that form sheets are called Stratus, meaning layer. The term Nimbus, which means cloud, refers to low, grey rain clouds. Alto is used to describe mid level clouds. Finally, convective clouds have a vertical development extending through large portions of the atmosphere.
CERES S'COOL Project
http://scool.larc.nasa.gov
SUPPLY & DEMAND
NEEDS MET

New S'COOL Outreach Strategies

- Alaska outreach
  - ¬ E-mail sent to 55 school divisions (end of September)

    Response rate 30%, still receiving
  - ¬ Ambassador, Carol Clark, presented at Alaska State Science and Mathematics Conference (mid-October)
  - ¬ AK registrations have increased from 6 to 10 since since September 28
- States with successful ambassadors: AK, OR, NY
- Additional states targeted for ambassadors: NM, PA, GA, IN, WV, WA

Education Outreach

Soaring to New Heights